

CLAIMS

What is claimed is

1. An improved damping or reinforcement structure for an
5 automotive vehicle, comprising:

a wall of a first material;

a layer of metal foam opposing the wall of the first material; and

a layer of structural adhesive bonded to the wall and the layer of metal
foam.

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2. A structure as in claim 1 wherein the layer of adhesive
separates the wall from the layer of metal foam such that a significant amount
of open space is between the wall and the layer of metal foam.

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3. A structure as in claim 2 wherein the layer of adhesive is applied
as a continuous or non-continuous strip extending adjacent a peripheral edge
of the wall or the layer of metal foam.

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4. A structure as in claim 3 wherein the layer of adhesive
substantially surrounds the open space.

5. A structure as in claim 1 wherein the adhesive is a heat
expandable material.

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6. A structure as in claim 1 wherein the structure thickness is no
greater than 75 mm.

7. A structure as in claim 1 wherein the structure thickness is no
greater than 50 mm.

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8. A structure as in claim 1 wherein the wall and the layer of foam
material are substantially coextensive with each other.

9. A structure as in claim 1 wherein the wall and the layer of foam material are located between a passenger compartment and an engine compartment of the automotive vehicle.

5 10. A structure as in claim 1 wherein the adhesive has a glass transition temperature greater than 70 °C

11. An improved damping or reinforcement structure for an automotive vehicle, comprising:

10 a panel formed of a first material, the first material being a metal;

a layer of foam material formed of a metal foam selected from magnesium foam and aluminum foam;

a viscoelastic adhesive that is bonded to the panel and the layer of foam material; and

15 a structural adhesive that is bonded to the panel and the layer of foam material wherein:

i) the structural adhesive is a heat expandable material; and

ii) the structure is located between a passenger compartment and an engine compartment of the automotive vehicle.

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12. A structure as in claim 11 wherein the adhesive separates the layer of foam material from the panel and at least 50 % of the space between the panel and the layer of foam material is filled by the viscoelastic adhesive.

25 13. A structure as in claim 12 wherein the structural adhesive is applied as a continuous or non-continuous strip extending adjacent a peripheral edge of the panel or the layer of metal foam.

30 14. A structure as in claim 13 wherein the structural adhesive substantially surrounds the viscoelastic adhesive.

15. A structure as in claim 11 wherein the structural adhesive is a heat expandable material.

16. A structure as in claim 11 wherein the structure thickness is no greater than 50 mm.

17. A structure as in claim 11 wherein the panel and the layer of
5 foam material are substantially coextensive with each other.

18. A structure as in claim 11 wherein both the panel and the layer of foam material are located between the passenger compartment and the engine compartment of the automotive vehicle.

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19. A structure as in claim 11 wherein the adhesive has a glass transition temperature greater than 70 °C

20. An improved damping or reinforcement structure for an
15 automotive vehicle, comprising:

a panel of a first material, the panel having a thickness of between about 1.0 mm and about 2.0 mm, the first material being selected from aluminum, steel or magnesium;

20 a layer of viscoelastic adhesive bonded to the panel, the viscoelastic adhesive being thermally expandable from about 5% to about 2000% its original size at a temperature of 200 °F or greater, the layer of adhesive being between about 0.5 and about 2.0 mm thick; and

25 a layer of a metal foam bonded to the viscoelastic adhesive, the metal foam being selected from aluminum foam and magnesium foam, the layer of metal foam being between about 12 mm and about 15 mm thick;

wherein i) each of the panel, the layer of viscoelastic adhesive and the layer of metal foam are disposed between a passenger compartment of the automotive vehicle and an engine of the automotive vehicle, ii) the layer of foam is closer to the engine than the panel and iii) the reinforcement structure
30 can be packaged for a thickness of no greater than 50 mm thick.